IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, et al.,	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	**05-CV-0329 GKF-SAJ**
	)	
TYSON FOODS, INC., et al.,	)	
	)	
Defendants.	)	
	)	

EXPERT REPORT
of
HERBERT L. DuPONT, M.D.

October 14, 2008

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Fecal indicators do not tell the source of the contamination whether it be from animal species, human beings or the environment (9). Research laboratories are developing methods to help determine origin of intestinal bacteria. See later discussion of microbial source tracking (MST).

> When looking at the contribution of a single industry or animal source, laboratory methods of water quality should focus on detection of pathogens in water, particularly those pathogens known to be associated with the industry of interest

The most important laboratory approach in determining whether water poses a risk of human illness is direct identification of disease-causing microbes in the water (10). Research groups are actively working on this area (see area number 6, below for an extensive discussion of this topic).

> Bacterial markers (fecal indicator bacteria) currently being assayed in rivers and lakes often come from the environment without directly representing either an animal or a human fecal source

The bacterial markers may not directly reflect organisms of fecal origin. Studies have shown that *E. coli* can persist in water sources throughout the year in adjacent soil, sediments, bank seeps (11) and algae (12). Finding persistent foci of *E. coli* and other fecal indicator bacteria alive and propagating in soil (13) and multiplying in wetlands (14) limits the value of fecal indicator bacteria as markers of fecal contamination or as warnings that disease-causing microbes are present.

> The laboratories performing biologic marker studies often provide inaccurate results

The various laboratories performing these assays frequently make errors in laboratory work providing inaccurate data (15) underscoring the need for targeted epidemiologic studies to determine the presence of a water associated public health problem.

2. The Levels of Fecal Indicator Bacteria in the IRW Approximate Levels Seen With Many Water Sources in Oklahoma and the United States and Human Disease Rates in the Watershed Approximate those Seen in Other Regions

The presence in water of low numbers of bacteria of possible fecal origin does not predict a body of water will be associated with increased rates of human disease (16). The key is to show that an organism of water origin is actually causing human illness in a watershed area. This is done though epidemiological study which is critical to providing evidence that one or more waterborne pathogens are producing illness in people (10). Epidemiologic investigations are methodologically sound and are essential to learning whether a problem exists and what disease-producing pathogens are responsible for human illness (17). Such epidemiological studies have allowed public health authorities to focus on the pathogen(s) of interest as has been done in previous waterborne outbreaks in the United States including outbreaks from: recreational water of Crater Lake caused by enterotoxigenic *E. coli* (ETEC) from a human source (18); drinking water in Rome, New York caused by *Giardia* due to contamination by beavers and other lower mammals (19); drinking water associated *Cryptosporidium*-induced illness in Milwaukee (20)

from cattle; and drinking water in Aspen, Colorado due to *Giardia* (21) from lower mammals in the wild. If epidemiologic studies had not been performed these outbreaks would likely have remained undetected. Also, none of these outbreaks came from poultry operations or from poultry.

Finding that isolated spots in the IRW have occasionally failed to meet the EPA 1972 Clean Water Act standards does not mean that it is unsafe for human recreation or that excessive illness will result by human exposure. Approximately 35% of rivers and 45% of lakes in the U.S. do not meet the 1972 Clean Water Act standards to be swimmable or fishable, thus are considered impaired (USEPA. The quality of our Nation's waters; EPA-841-S-00-001; US Environmental Protection Agency, Office of Water: Washington, DC, 2000). The only way that reduced human safety on the part of a body of water can be determined is by epidemiologic study of human illness. The only suitable indirect method to determine lack of safety of a water body is finding well-defined and fully-virulent enteric pathogens in the water.

The Plaintiff consultants estimate based on indicator bacteria and the number of person using the Illinois River and its tributaries, that 8 per 1,000 people (0.8%) develop illness each year because of the contaminated water. Considering the number of persons using the water provided by Dr. Caneday, the consultants estimate that 1,200 illnesses occur annually because of the water quality. In my opinion, there is no scientific basis for this estimate. The human health risks from water depend upon a number of factors including presence of pathogens in the water, source of indicator bacteria (animals versus humans) and use of the water. Concerning use of the water, floating or boating, where ingestion of water is unlikely, is not associated with risk for waterborne disease. Drinking water from household wells is of greater concern if pathogens are present in the water. Of perhaps greater importance than this estimate of 1,200 illnesses from water exposure, there is absolutely no reason to point to the poultry industry as the important source of water contamination. If excessive waterborne disease is occurring in the IRW, I believe it would most likely reflect water pollution from local human sources (e.g. septic tanks), with water pollution from cattle or wild animals both being more likely than pollution from poultry sources.

The Health Commissioner from Oklahoma, Dr. Michael Crutcher was not concerned with the number of cases of enteric infections in his state. If I had been the health commissioner, I too would have come to this conclusion based on the number of cases of illness identified in the counties adjacent to the IRW. Dr. Crutcher did not suggest that epidemiologic studies be performed. I reviewed the data on reported human cases of *Campylobacter* and *Salmonella* diarrhea in the counties adjacent to the IRW and found their rates comparable with most of the counties of the United States outside the IRW. There is absolutely no data to suggest that an enteric microbial health risk has existed or exists in the IRW.

To determine that water microbes are actually capable of causing human disease, it is necessary to perform epidemiological studies looking at human cases and determining human risk (22). The arguments of the Oklahoma state consultants about cases of human enteric illness along the IRW are curious. On one hand they state that most illness cases are not detected by normal surveillance so there must be many undetected cases of disease occurring related to the local water sources. On the other hand, they argue that focused epidemiologic study is not needed to

determine actual risk, since no clustering of cases has been documented. Without any scientific justification, they claim to know there is a problem without clinical or epidemiologic evidence, instead use only faulty logic. When epidemiologic studies are not recommended or performed, health authorities are satisfied with rates of illness found with their normal surveillance of disease. In these settings, as in the IRW, health authorities have enough information about disease rates in their population and need no further study.

3. **In the Absence of Heavy Water Contamination and Large Community Illness Outbreaks, Disease-Producing Microbes in Water Sources Are Not Present or Present in Low Concentrations, Showing Low Rates of Infectivity with Organisms of Non-Poultry Sources Predominating**

Water supports the growth of relatively low levels of bacteria unless contaminated with raw human sewage. Microbes can survive for variable time periods in water but it is a relatively hostile environment for microbial viability and growth. For this reason, cultures of water looking for bacteria, indicator bacteria or pathogens, must determine presence of microbes in a volume of water, usually 100 mL. In contrast, food is a microbial growth facilitating media and bacterial cultures are performed per one gram of food (equivalent to 1 mL or 100^{th} of the amount of water cultured routinely). The organisms of concern for poultry contamination are *Campylobacter* and *Salmonella*. There are no other human disease-causing microbes found importantly in poultry or poultry feces (see later comments). For that reason, I will concentrate on these two disease-producing microbes in further discussion.

The most important variable in developing human illness from contaminated water is presence of human excreta associated with full water-body contact and submersion of the head with ingestion of recreational water (23).

4. **Food is the Major Source of Human Enteric (Intestinal) Infections in the United States and in Oklahoma with Water Producing Much Lower Rates of Human Illness**

The CDC estimates that there are 76 million cases of foodborne illness each year in the United States. If we assume that there are 298,000,000 persons in the U.S. and that there are 3,600,000 persons in Oklahoma, we would expect to have approximately 918,118 cases of foodborne illness in the state each year. The consultants for the state estimate that the water of the IRW causes 1,200 cases of illness each year. While I am not convinced by their figures, it is useful to compare 1,200 with nearly one million to see where the state should focus their attention in efforts to improve the health of Oklahoma residents.

The EPA estimates that in the U.S. drinking water causes approximately 8.5% of the cases of acute gastroenteritis seen in the U.S. translating to 16. 4 million cases per year (24). In drinking water outbreaks, four enteropathogens have been most commonly implicated, *Cryptosporidium*, *Giardia*, noroviruses and *Shigella*. For each of these organisms, illness can be produced in humans after exposure to low doses (less than 100 organisms, perhaps a single organism) and human waste from adjacent septic tanks most commonly explains ground water contamination (25).